PROCESOS Y DIFRENTES TIPOS DE REPARACIONES EN CARROS TANQUE

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1. RL1 / RL2

2. RETROFIT – REVISION DE DISEÑO

3. CALIFICACION Y CALIBRACION DE TONEL

4. PRUEBAS DE CALIDAD

5. MANTENIMIENTO

RL1 / RL2

Table B.3 Repair levels for activity codes B24 and/or B83

Repair Level	Description
RL1	Demonstrate proficiency in performing welding to tank car tank material, NDT method MT or PT, and post-weld heat treatment. This level excludes repairing a through-the-tank-car tank defect (insert or through-the-shell/ head crack). This demonstration must be performed on a tank car tank or test plate and must be performed on a material from a material group for which the facility seeks certification.
RL2	Demonstrate proficiency in performing welding to tank car tank material, NDT, and post-weld heat treatment. This level includes repairing a through-the-tank-car tank defect (insert or through-the-shell/head crack). This demonstration must be performed on a tank car tank or test plate and must be performed on a material from a material group for which the facility seeks certification.

RL1 / RL2

Requisitos de demostracion de RL1

Soldador calificado en el taller, de acuerdo al appendice W.

Deberan realziar la reparacion durante la inspeccion.

Placa de prueba para desarrollar la prueba de acuerdo al parrafo 2.3.10

Desarrollar las pruebas no destructivas aplicables

RL1 / RL2

Requisitos de demostracion de RL2

Soldador calificado en el taller, de acuerdo al apendice W.

Deberan realizar la reparación durante la inspección.

Hacer la reparación (inserto al cuerpo o facturas en tapa)

Placa de prueba para desarrollar la prueba de acuerdo al parrafo 2.3.11

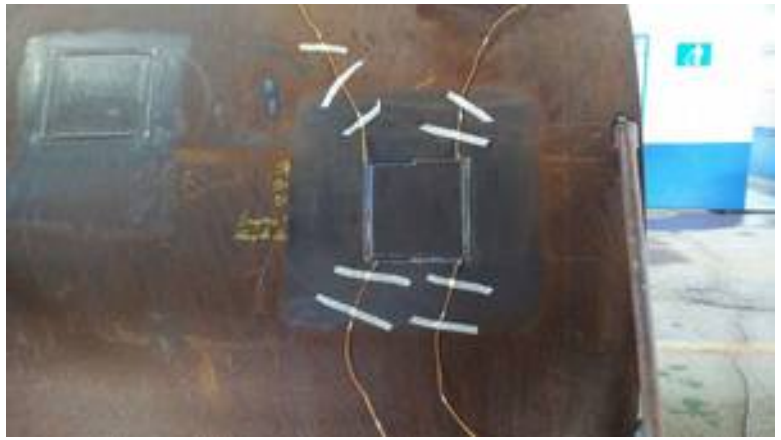
Desarrollar las pruebas no destructivas aplicables

RL1 / RL2

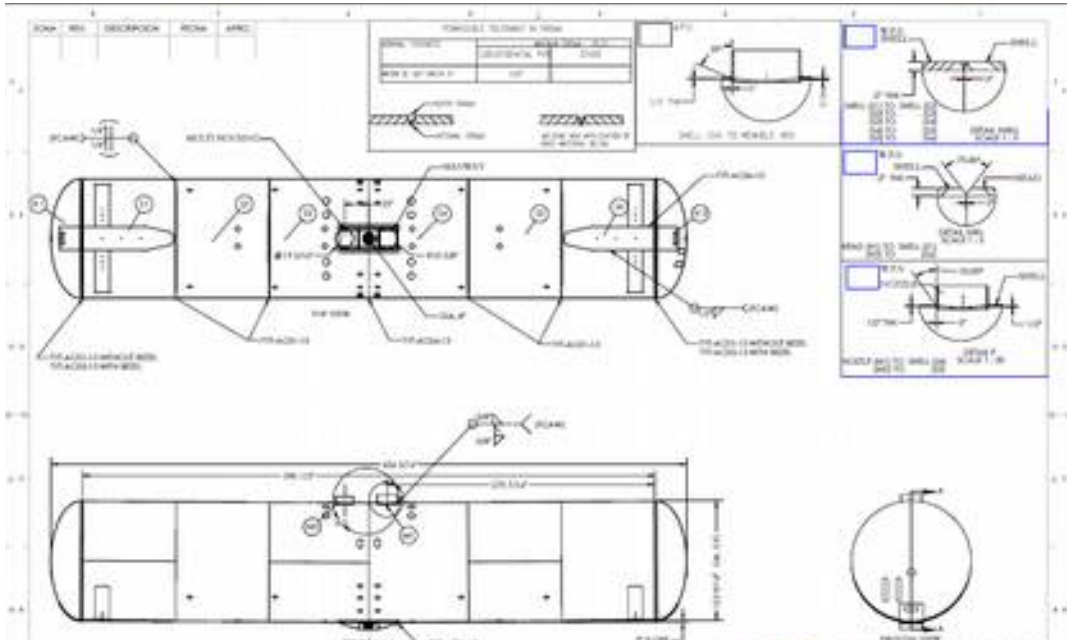
If the facility is certified to repair level "RL1," does the facility demonstrate proficiency in performing welding to tank car tank material, NDT method MT or PT, and postweld heat treatment? This level excludes repairing a through-the-tank-car tank defect (insert or through-the-shell/head crack). This demonstration must be performed on a tank car tank or test plate and must be performed on a material from a material group for which the facility seeks certification.

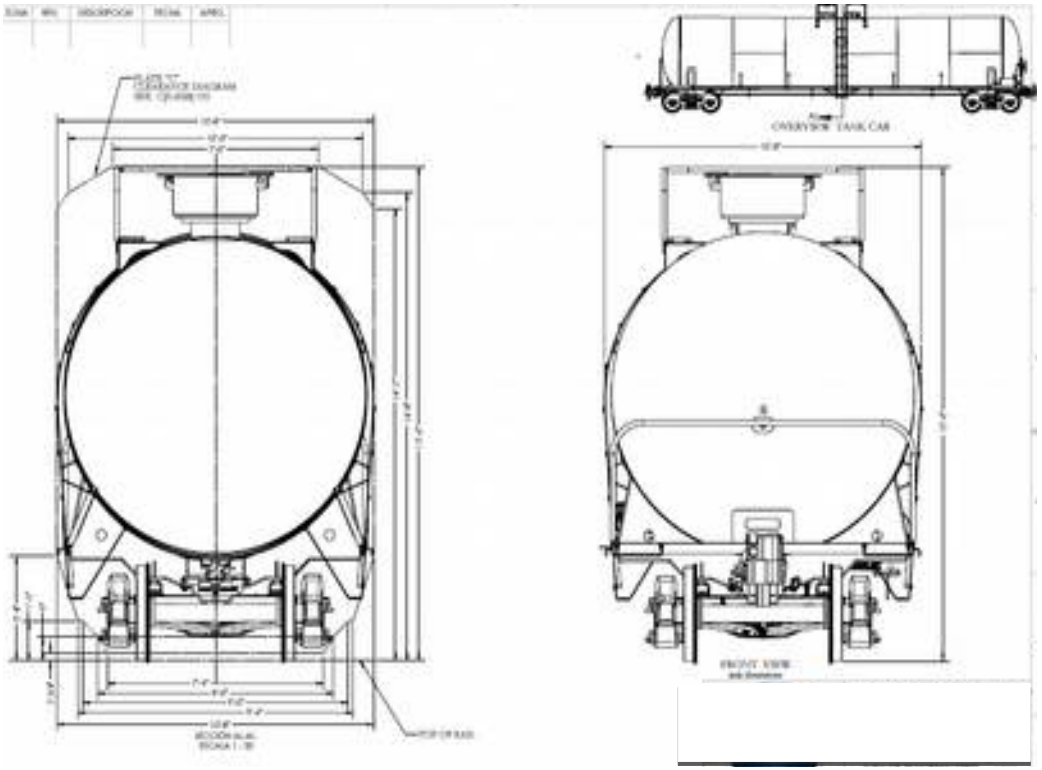
If the facility is certified to repair level "RL2," does the facility demonstrate proficiency in performing welding to tank car tank material, NDT, and postweld heat treatment? This level includes repairing a through-the-tank-car tank defect (insert or through-the shell/ head crack). This demonstration must be performed on a tank car tank or test plate and must be performed on a material from a material group for which the facility seeks certification.

RL1 / RL2



RETROFIT – REVISION DE DISEÑO





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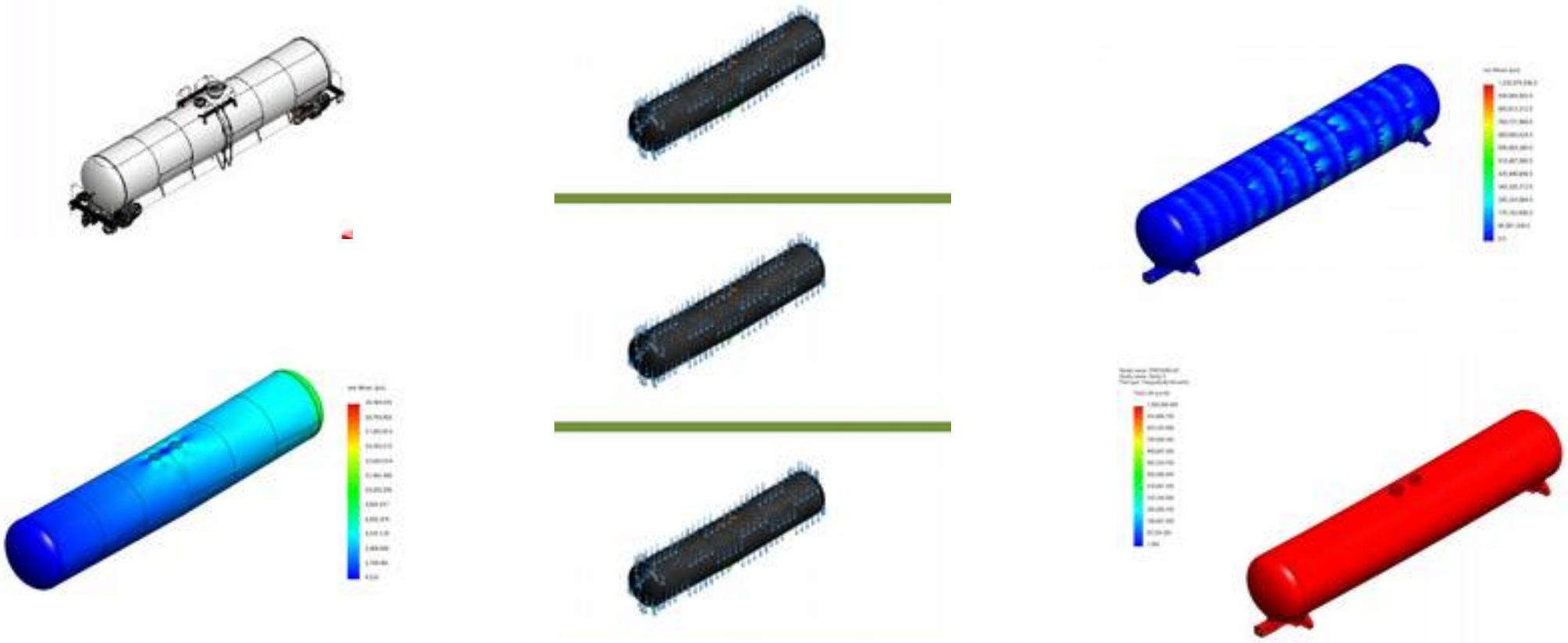

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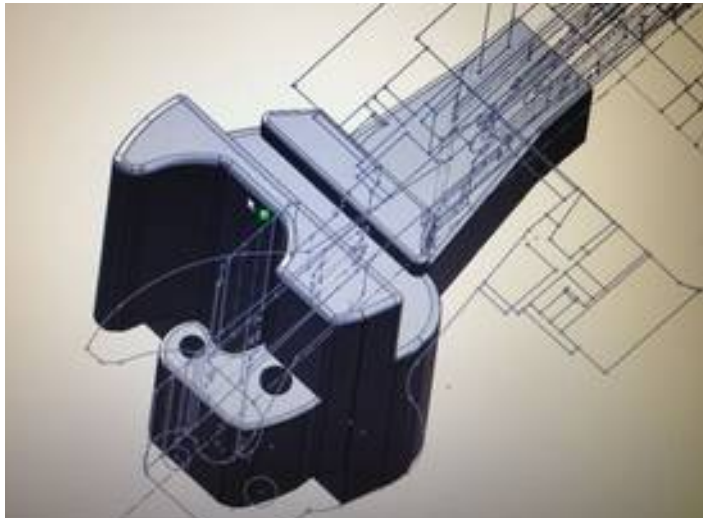

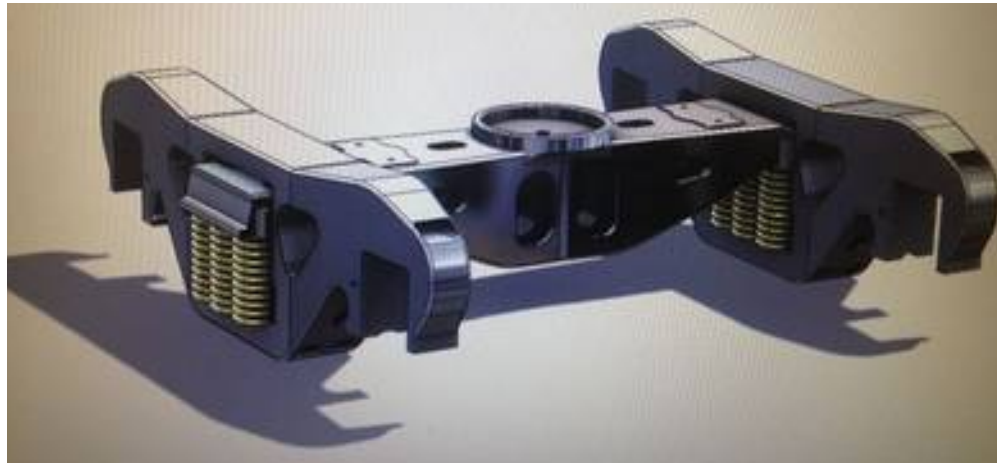

RETROFIT – REVISION DE DISEÑO

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PROCESO EN PLANTA

PROCESO EN PLANTA

RETROFIT – REVISION DE DISEÑO

DOT/TC-117R100W Tank Car for Flammable Liquid Service

DOT/TC-117J100W Tank Car for Flammable Liquid Service

Courtesy of Railway Association of Canada.

CALIFICACION Y CALIBRACION DE TONEL

Metodo volumetrico:

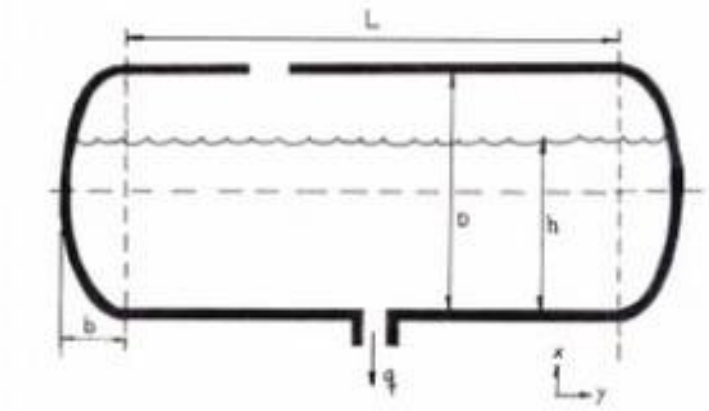
Se realizan con ayuda de una instalacion patron que cuenta con un medidor de flujo que garantice la exactitude requerida y una cinta metalica patron con plomada, ambos calibradas y certificados, puede ser por llenado y por vaciado

La calibracion puede realizarse con combustible o con agua, normalmente se utiliza agua debido a que garantiza mayor seguridad por ser un liquid poco volatile y no inflammable. Puede ser por llenado y por vaciado

Los tanques deben estar a nivel del suelo o elevados en una superficie nivelada

La table de calibracion volumentrica resultante puede emplearse, como referencia para la instalacion de equipos de sondeo para la determinacion del tanque de manera automatizada

CALIFICACION Y CALIBRACION DE TONEL



Condiciones del Aforo:
Durante el aforo deben observarse todas las reglas de seguridad y contra incendiios necesarios para la prevencion de accidents de cualquier tipo.

Es necesario que el tanque este totalmente vacio y limpio antes de comenzar el trabajo

Teneer control sobre la temperature ambiental y del liquid de trabajo

El tanque no debe presenter fugas – debe estar hermetico al momento del llenado

CALIFICACION Y CALIBRACION DE TONEL

- PATRONES DE REFERENCIA

  Incertidumbre recomendada del 0.02% calibrada por el laboratorio de metrología autorizado
  Cuello gradudao que proporciona una major exactitude en la medición por la alta resolución de su escala
  Bandas reforzadas que previenen distorsión de la medida volumétrica cuando se encuentra totalmente lleno o cuando esta siendo transportado

CALIFICACION Y CALIBRACION DE TONEL

MEDIDORES MAESTROS

- Medidores de despalzamiento – en el interior dividen el volume total en parciales
- Medidores de flujo

VENTAJAS:

- Respuestas favorable a variaciones en la viscosidad del flujo
- Calibracion de medidor de flujo
- No require arreglo de tuberias
- Facil transportacion, Buena exactitud (incertidumbre +- 0.06%) , registrador mecanico de su autonomia
- Muestra directamente el volume medido

CALIFICACION Y CALIBRACION DE TONEL

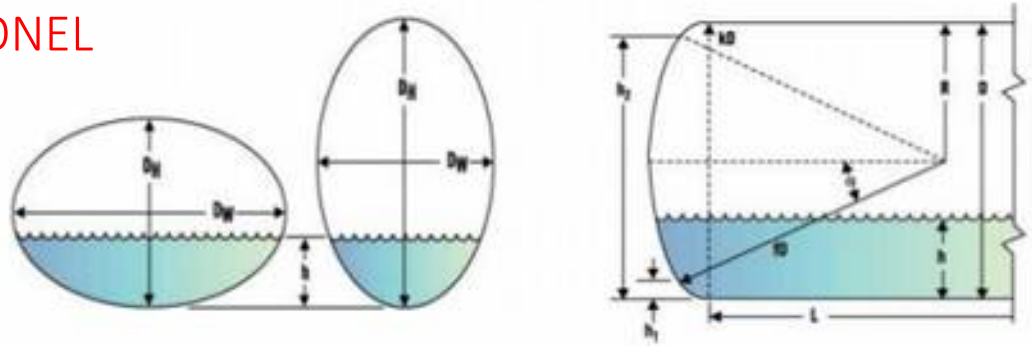
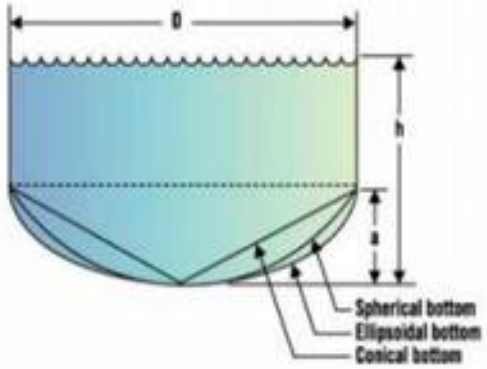
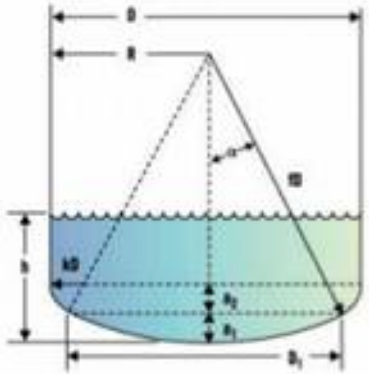


Figura N°3 – Tanques horizontales de sección elíptica y cilíndrica - variables a considerar para la función de calibración





CALIFICACION Y CALIBRACION DE TONEL

Sub-caso3: el nivel inicial del líquido se encuentra en la parte cilíndrica del mismo:

El tiempo de vaciado será: $t = t_{cilin} + t_{semielip}$

siendo: $t_{cilin} = \frac{D^2}{d^2}\sqrt{\frac{2}{g}(1 + f\,L/d)}\left(\sqrt{H_o} - \sqrt{H_f}\right)$ con $H_f = b + h_c$

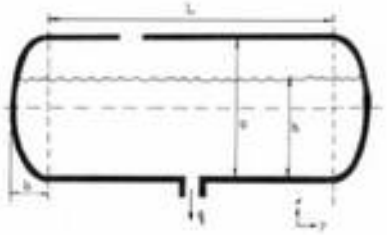
$$t_{semielip} = C\left[\left(16/15\,h_o^2 + 8/3\,b\,h_o\right)\sqrt{h_o} - \left(16/15\,h_c^2 + 32/15\,b\,h_c - 14/15\,b^2\right)\sqrt{b + h_c}\right] \quad (5)$$

con $H_o = b + h_o$ y $H_f = h_c$

3. Tanque cilíndrico vertical con fondo semiesférico con cañería asociada

Se aplican las mismas fórmulas que para tanque cilíndrico vertical con fondo semielíptico pero el valor de b se reemplaza por R o D/2.

4. Tanque cilíndrico horizontal con cabezales semielípticos sin cañería asociada

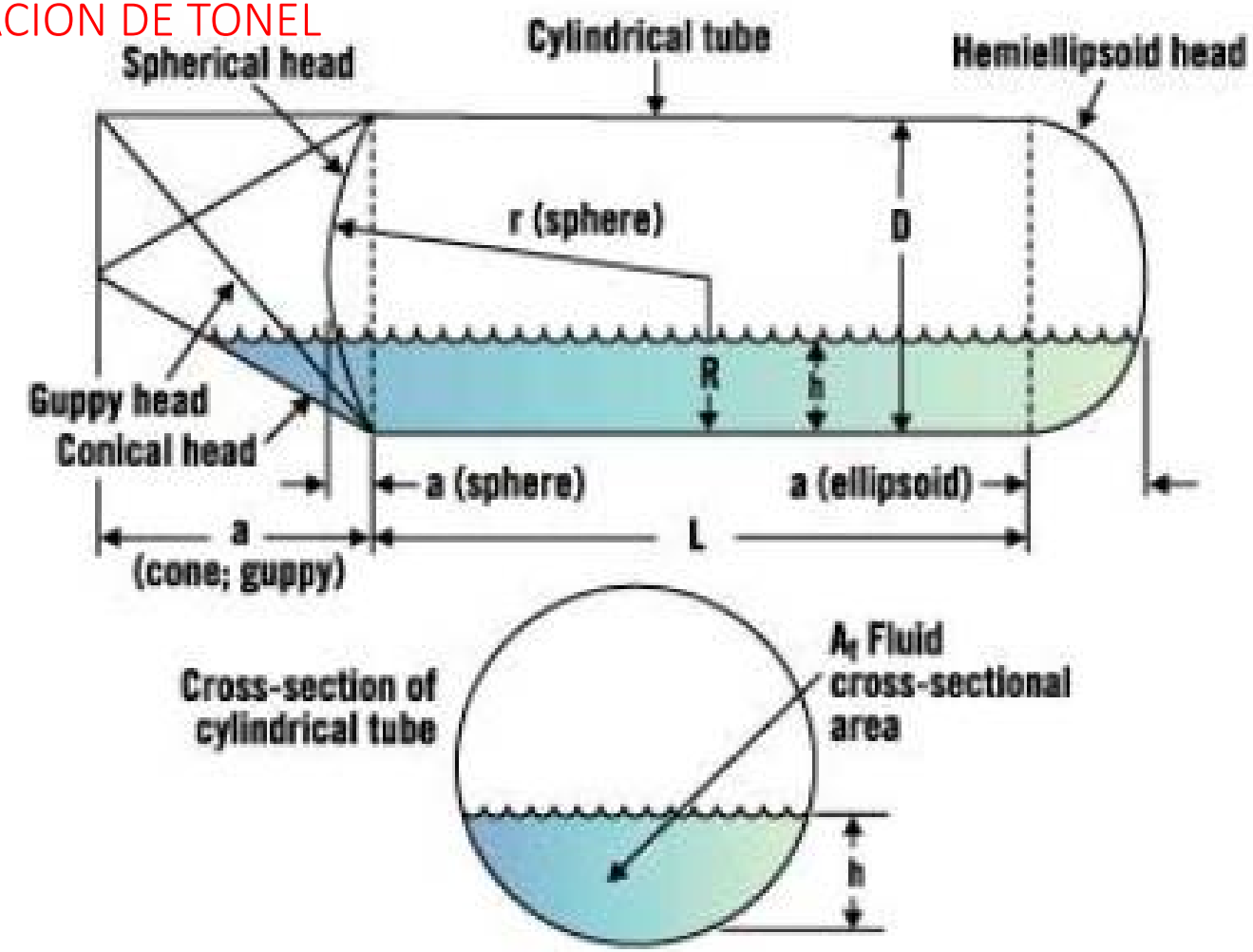


El tiempo total de descarga se calcula mediante la suma del tiempo obtenido para tanque cilíndrico horizontal con fondo plano y del tiempo de descarga de los cabezales semielípticos.

$$t = t_{cilin} + t_{cabezalsemielip}$$

De esta manera, se obtiene:

CALIFICACION Y CALIBRACION DE TONEL



CALIFICACION Y CALIBRACION DE TONEL

PRUEBAS DE CALIDAD

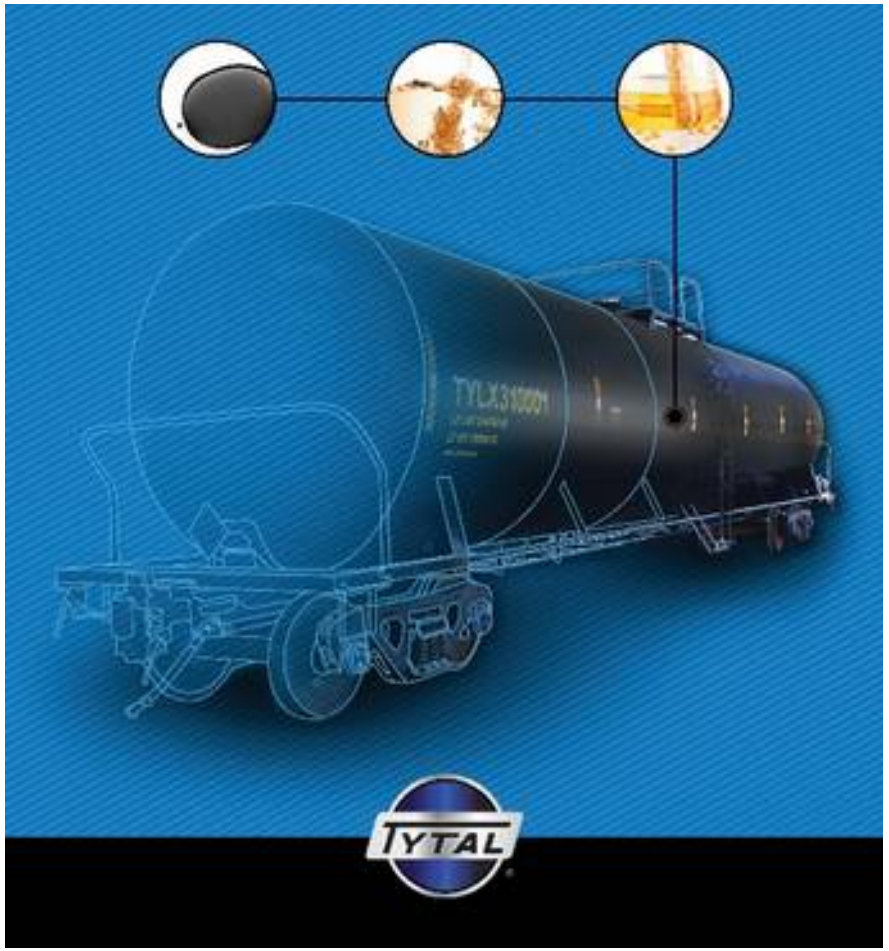
If this facility manufactures tank car tanks, are tank and/or interior heater system hydrostatic tests, required by 49 CFR §§179.12(b), 179.100-18, and/or 179.200-22, as applicable, performed in accordance with the procedures outlined in Appendix D paragraph 4.2.1?
Are the retest, qualification, and inspection requirements of 49 CFR §§180.509 and 180.511, and the additional AAR requirements contained in Appendix D, paragraphs 3.0 through 3.2, being met?
Are pressure relief valve gaskets or gasket seals made of elastomeric materials, normally exposed to the lading, replaced when the device is tested as required by Appendix D, paragraph 3.4?
At the time of tank or pressure relief valve qualification, do tank cars equipped with bottom outlets have the outlet caps and nozzles inspected for wear in accordance with the requirements of Appendix D, paragraph 3.6?
Are the pressure relief valve and hydrostatic test procedures contained in Appendix D, paragraph 4.0 (particularly paragraph 4.3, step 5 regarding inspection of PRVs per the manufacturer's guidelines) being followed?
At each tank qualification, are hinged and bolted manways on nonpressure cars inspected, maintained, and tested as prescribed by Appendix D, paragraph 6.0?
Do inspectors have available, and use, welding gauges and a tag system?

Does this facility maintain an AAR-approved quality assurance program as required by 49 CFR §179.7 and Appendix B, paragraph 2.4?
As required by 49 CFR §179.7(b)(8), does the facility's quality assurance program contain provisions indicating that the requirements of the AAR specifications for tank cars apply to tank car construction, repair, and/or qualification processes?
Does the facility employ a qualified welding inspector as required per Appendix B, paragraph 2.6.2? The following shall be provided with this report: a list of name(s), qualification (AWS, CSA, or an in-house program), and date of expiration.
If the facility does not employ a welding inspector, an Exhibit B-1 should be on file for subcontractors performing this function as required by Appendix B, paragraph 2.7.1. Does the facility have Exhibit B-1s?
Is the facility's NDT program administered by an NDT Level III as required by Appendix T, paragraph 1.4.1? In the comment field of this section enter the Name of NDT Level III and date of expiration per method.
Are the qualification requirements for the NDT Level III included in the written practice for qualification and certification as required by Appendix T, paragraph 1.8.4?
Are the NDT personnel employed by this facility qualified and certified in accordance with a written practice, as required by Appendix T, paragraph 1.5, that includes the applicable requirements of Appendix T, paragraphs 1.6 through 1.17?
Does the facility have written procedures, approved by an NDT Level III, for the NDT methods utilized as required by Appendix T, paragraph 1.18?
Have all NDT procedures been qualified and technically approved by an NDT Level III as required by Appendix T, paragraph 1.19?
Is the calibration of NDT equipment performed in accordance with M-1003, paragraph 2.8, and the facility's quality assurance program calibration requirements, as required by Appendix T, paragraph 1.22?
For NDT examinations (RT, PT, MT, and UT), are the acceptance criteria and personnel qualification requirements contained in Appendix W, paragraphs 11.1 through 11.5.3 being met?

Are NDT tests documented and records maintained as required by Appendix T, paragraphs 1.20.1 through 1.21?
Were any NDT examinations observed; and/or NDT reports, radiographs, or PWHT/ LPWHT reports and charts reviewed during this inspection? If "Yes", provide details under "Comments."
Is the technical performance of Level I and II NDT personnel periodically evaluated and documented by an NDT Level III, as required by Appendix T, paragraph 1.10.2?
Does the facility's quality control program include the requirements of Appendix W, paragraph 10.2.3.4, regarding designated authority for the administration of the welding quality control program, technical supervision of welders, etc.?
Are written procedures (such as work instructions, welding/NDT procedures, etc.) provided to employees or otherwise made available at the work site to ensure that work on tank cars conforms to M-1002 specification, AAR approval, and the owner's acceptance criteria, as required by 49 CFR §179.7(d)?

MANTENIMIENTO

Item	Frequency (Years)	Task/Procedure
Tank Qualification: 49 CFR 180.509		
Visual inspection	10	MI-001
Structural integrity	10	MI-001
Thickness	10	MI-001
Safety systems	10	MI-001
Linings and coatings	8	MI-001
Leakage pressure test	After assembly	MI-001
Service equipment —Pressure relief device(s)	10	MI-001
Stub Sill Inspection (SS3, CPC-1094, CPC-1114)		
Stub sill	At tank qualification or mileage or time limit	MI-002
Sill pads	At tank qualification or mileage or time limit	MI-002
Field Manual, Rule 88.B.2		
Trucks	10	MI-003
Draft components	10	MI-003
Body bolster	10	MI-003
Appendix D, 3.0		
Stub draft sills (inboard of bolsters)	With 180.509(e)	MI-004
Sill pads (inboard of bolsters)	With 180.509(e)	MI-004
Sill attachment welds (inboard of bolsters)	With 180.509(e)	MI-004
Tank anchors	5	2030-01
Turnbuckles	5	2030-02
Center plate	5	2030-03
Side sills and end sills	5	2030-04
Side bearings	5	2030-05



¡Gracias!